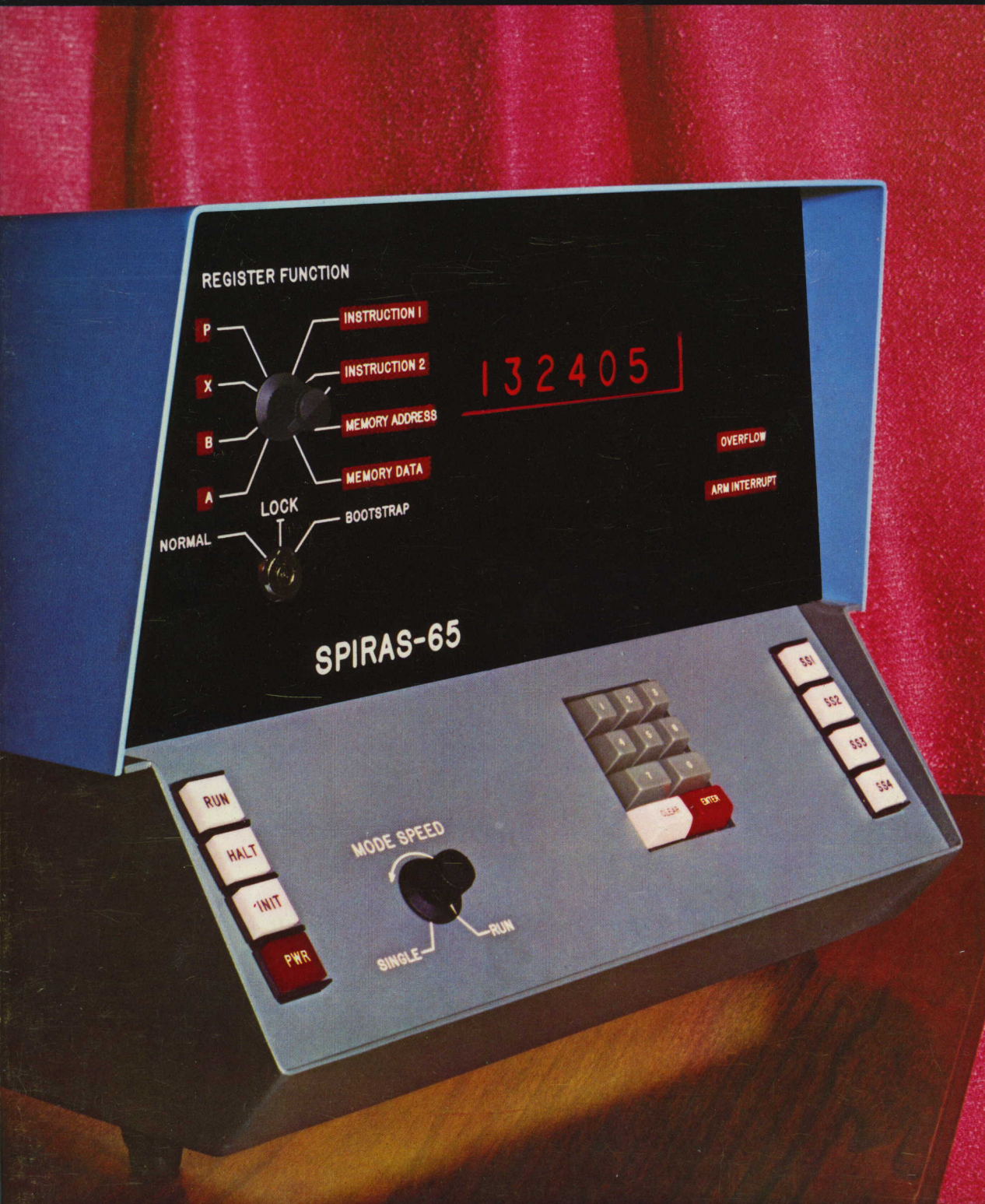
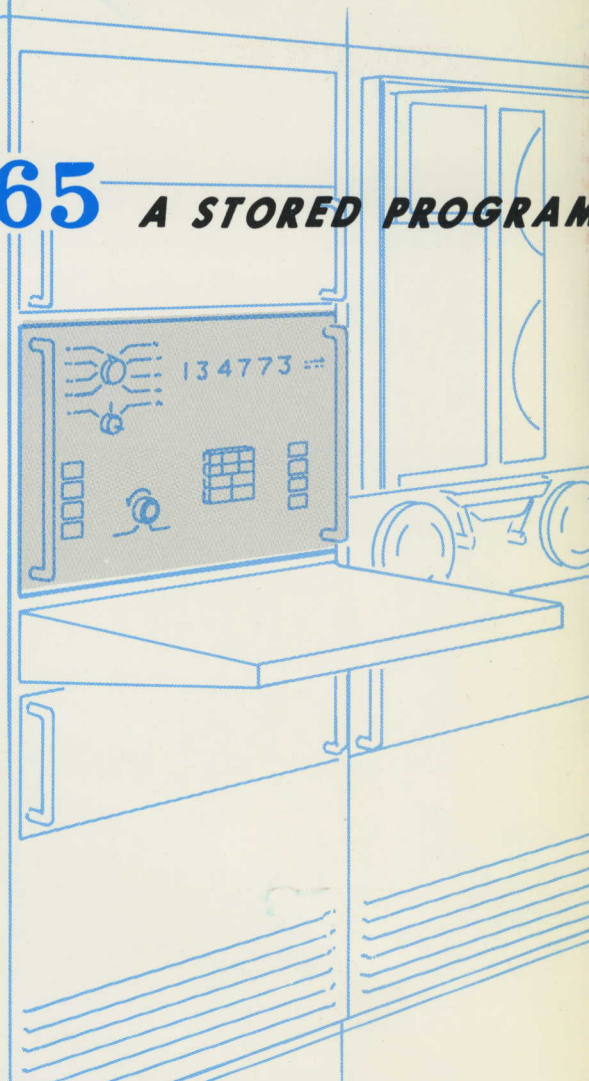
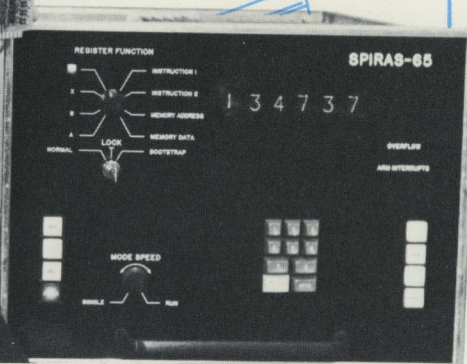


**FOR
SCIENCE,
INDUSTRY
AND
BUSINESS**



Spiras Systems, Inc.
Affiliate of
USM Corporation

SPIRAS-65 *A STORED PROGRAM*



SPIRAS-65 is a General Purpose Stored Program Controller/Processor expandable to 65 K of memory, representing unprecedented PERFORMANCE PER DOLLAR.

SPIRAS-65 may be efficiently applied as a Data Processor or Real-Time Controller in either a dedicated and/or satellite environment.

FOR

- Industrial/Manufacturing Processes
- Numerical Machine Tools
- Data Acquisition and Analysis
- Automatic Test and Instrumentation
- Function Generation
- CRT Display Graphics Generation
- Communications Data Concentration and Distribution
- Scientific Data Processing
- Business Data Processing

ITS CREATOR

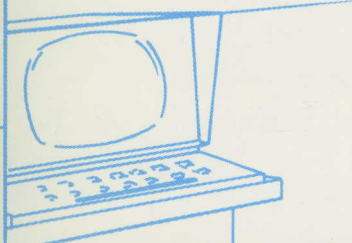
To understand the product you should know about its creator, about our fresh overview philosophy and system experience, our unique combination of talent, our total customer-service attitude, and why we designed the SPIRAS-65 to meet your needs.

Among the important commandments in our philosophy are:

- ▶ Communicate honestly and directly with the user in his own language without buzz words.
- ▶ Offer the total solution to the problem in terms of hardware and software, standard and custom.
- ▶ Provide supporting consultation, training, maintenance and a life line of information flow after the sale.

After a broad experience with available "mini-computers", we concluded that we could indeed offer dramatically improved utility, reliability and value. The approach was apparent - Build one machine without major options which includes as standard all of the performance characteristics afforded by the eclectic state of the art and realize the economy derived from large volume "one of a kind" production.

CONTROLLER / PROCESSOR



ARCHITECTURE - NVP

The SPIRAS-65 commits to hardware the IDEAL instruction repertoire to solve the broadest base system problems. The design utilizes NVP "non-volatile program" which is, in essence, a computer controlling a computer. This multigeneration system architecture also allows for customized instruction sets tailored to specific applications. NVP is a 512-word Read-Only-Memory, 32 bits long and expandable to 1024 words.

MAN/MACHINE

The SPIRAS-65 control panel is an I/O device allowing 90% of the main frame to be easily checked out by an operator. All register information is displayed on NIXIE® tubes in octal, decimal, or engineering units under program control. The data entry is via a NORMAL-WAY electronic keypad.

INDUSTRIAL DESIGN

Small LOW INERTIA circuit boards are used to reduce susceptibility to shock and vibration and minimize cost of spares.

EVALUATION

A Measurement of Computer Power - can only be made on a per application basis in terms of STORAGE/TIME/DOLLAR economy by evaluating the:

- Instruction Set —
- Index & Addressing Modes —
- Input/Output Modes —
- Software — Reliability —
- Human Interface — Training —
- Maintenance — Systems Support —

The specifications listed are STANDARD.

SPECIFICATIONS

GENERAL

- 16 Bit Parallel Binary
- Two's Complement Arithmetic
- Four Hardware Registers For Programmers Use
 - A Accumulator
 - B Extended Accumulator
 - X Index
 - P Program Counter

HARDWARE FUNCTIONS

- Bootstrap Loader
- Add/Subtract 3.6 μ sec
- Multiply 17. μ sec
- Divide 30. μ sec
- Normalize
- Double Precision Add 9.0 μ sec
- Double Precision Subtract 10.8 μ sec
- Floating Point Add, Subtract, Multiply, Divide
- Priority Interrupt
- Block Transfer Cycle Stealing I/O
- Extensive Conditional Instructions

ADDRESSING MODES

- Indexing with A and X Registers
- Direct Addressing to 65 K
- Relative Addressing with P Register ± 511
- Multilevel Indirect Addressing up to 32 K
- Immediate Operations

MEMORY

- 4096 to 65,536 words of Ferrite Core
- Cycle Time 1.8 μ sec

INPUT/OUTPUT CHARACTERISTICS

- UP TO 64 DEVICE CHANNELS
- 16 BIT TRANSFER
 - PARTY LINE - Parallel or buffered parallel 100 KC
 - DIRECT MEMORY CHANNEL (Block Transfer) 100 KC
 - DIRECT MEMORY ACCESS 500 KC

CONTROL/INDICATOR PANEL (REMOVABLE I/O DEVICE)

- DISPLAY (NIXIE) - Four Registers, Instruction Words
- Memory, Memory Address (in Octal, Decimal or under Program Control)
- CONSOLE STATUS INDICATOR
- DATA ENTRY - Octal Keypad
- PROGRAM SENSE - 4 Push Buttons
- MODE SWITCHES - Variable Speed

CONSTRUCTION

- MAIN FRAME COMPLEMENT: CPU with 21 IC/MSI
- GLASS EPOXY BOARDS: Up to 8K of core memory, 3 external device controllers, 10 channel I/O Bus, NVP Power Supply

LOGIC LEVELS

- DTL/TTL - 0 Volts, +5 Volts (0 Volts +3.5 Volts on I/O Busses)

DIMENSIONS

- Rack Mount with Slides 14" H x 19" W x 23" D
- Desk Top - 14" H x 19" W x 25" D

WEIGHT - 100 Pounds

- HUMIDITY - 0 to 95% Relative
- TEMPERATURE 10°C to 35°C

SOFTWARE

See Price List and "Excellence in Software"

PERIPHERALS

INTERFACES

OPTIONS

See Price List

ADDRESSING

A1

XXX	a(D)	e = a	} [a = 0 → 65535]
XXX*	a	a = (a)	
XXX	a(X)	e = a + (X)	
XXX*	a(X)	e = (a + (X))	
XXX*	a(Y)	e = (a) + (X)	
XXX	a(A)	e = a + (A)	
XXX	a(P)	e = a + (P)	
XXXI	a	operand = a	

A2

XXX	a(D)	e = a	[a = 0 → 65535]
XXX*	a	e = (a)	[a = 0 → 65535]
XXX	a(X)	e = a + (X)	[a = 0 → 65535]
XXX*	a(Y)	e = (a) + (X)	[a = 0 → 65535]

A3

XXXS	a(D)	e = a	[a = 0 → 1023]
XXXS*	a	e = (a)	[a = 0 → 1023]
XXXS	a(X)	e = a + (X)	[a = 0 → 1023]
XXXS	a(P)	e = a + (P)	[a = -512 → +511]

SPIRAS-65 INSTRUCTIONS

$$\text{CHP (Computer Horsepower)} = \frac{\text{Work}}{\text{Instruction}} \times \frac{\text{Instruction}}{\text{Second}}$$

$\frac{\text{Work}}{\text{Instruction}}$ is determined by: — Size and organization of instruction set
— Flexibility of addressing and indexing modes
— Input/output structure

SPIRAS-65 offers the highest CHP per dollar in the industry.

LOAD/STORE

MNEMONIC	DESCRIPTION	TIMING
LDA	a1 } (e) → (A)	[3]
LDAS	a2 } (e) → (A)	[2]
LDB	a1 } (e) → (B)	[3]
LDBS	a2 } (e) → (B)	[2]
LDX	a1 } (e) → (X)	[3]
LDXS	a2 } (e) → (X)	[2]
STA	a1 } (A) → (e)	[3]
STAS	a2 } (A) → (e)	[2]
STB	a1 } (B) → (e)	[3]
STBS	a2 } (B) → (e)	[2]
STX	a1 } (X) → (e)	[3]
STXS	a2 } (X) → (e)	[2]
DLD	a1 (e), (e+1) → (A), (B)	[4]
DST	a1 (A), (B) → (e), (e+1)	[5]
LEA	a1 e → (X)	[4]

ARITHMETIC

MNEMONIC	DESCRIPTION	TIMING
ADD	a1 } (A) + (e) → (A)	[3]
ADDS	a2 } (A) + (e) → (A)	[2]
ADB	a1 (B) + (e) → (B)	[3]
ADX	a1 (X) + (e) → (X)	[3]
SUB	a1 } (A) - (e) → (A)	[3]
SUBS	a2 } (A) - (e) → (A)	[2]
MUL	a1 (B) * (e) → (A), (B)	[11]
MULS	a2 (B) * (e) → (A), (B)	[10]
DIV	a1 (A), (B)/e → (B), rem → (A)	[15]
DADD	a1 (A), (B) ++ (e), (e+1) → (A), (B)	[5]
DSUB	a1 (A), (B) -- (e), (e+1) → (A), (B)	[6]
FADD	a1 (A), (B), +(e), (e+1) → (A), (B)	[11-28]
FSUB	a1 (A), (B), -(e), (e+1) → (A), (B)	[11-28]
FMUL	a1 (A), (B), *(e), (e+1) → (A), (B)	[60-70]
FDIV	a1 (A), (B), /(e), (e+1) → (A), (B)	[60-70]
INR	a1 (e) + 1 → (e)	[4]
DCR	a1 (e) - 1 → (e)	[4]

SKIP INSTRUCTIONS

MNEMONIC	DESCRIPTION	TIMING
SKIP	unconditionally skip 1 word	[1]
SAZ	skip 1 word if (A) = 0	[1]
SANZ	skip 1 word if (A) ≠ 0	[1]
SAN	skip 1 word if (A) < 0	[1]
SANN	skip 1 word if (A) ≥ 0	[1]
SAP	skip 1 word if (A) > 0	[1]
SANP	skip 1 word if (A) ≤ 0	[1]
SBZ	skip 1 word if (B) = 0	[1]
SBNZ	skip 1 word if (B) ≠ 0	[1]
SXZ	skip 1 word if (X) = 0	[1]
SXNZ	skip 1 word if (X) ≠ 0	[1]
SOF	skip 1 word if (OV) = 0	[1]
SNOF	skip 1 word if (OV) ≠ 0	[1]
SS1	skip 1 word if SS1 on	[1]
SNS1	skip 1 word if SS1 off	[1]
SS2	skip 1 word if SS2 on	[1]
SNS2	skip 1 word if SS2 off	[1]
SS3	skip 1 word if SS3 on	[1]
SNS3	skip 1 word if SS3 off	[1]
SS4	skip 1 word if SS4 on	[1]
SNS4	skip 1 word if SS4 off	[1]
SKT	n skip 1 word if any conditions True	[1]
SKF	n skip 1 word if all conditions False	[1]
CAS	a1 IF (R) < (e), don't skip	[3]
CBS	a1 IF (R) = (e), skip 1 word	[3]
CXS	a1 IF (R) > (e), skip 2 words	[3]
DRS	a1 (e) - 1 → (e), skip if (e) = 0	[4]
IXS	n (X) = (X) + n, skip if (X) = 0 [n=0 → 511]	[2]
DXS	n (X) = (X) - n, skip if (X) = 0 [n=0 → 511]	[2]

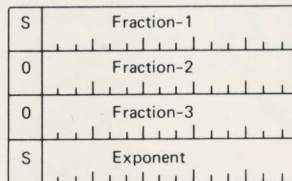
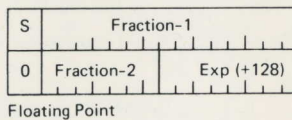
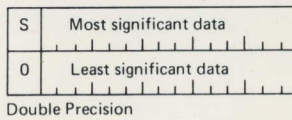
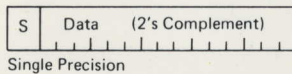
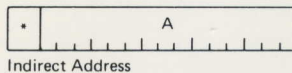
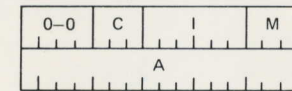
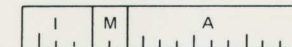
JUMP/CALL INSTRUCTIONS

MNEMONIC	DESCRIPTION	TIMING
JMP	a1 (e) → (P)	[3]
JMPS	a2 (e) → (P)	[2]
CALL	a1 *+2 → e, e+1 → (P)	[3]
CALS	a2 *+1 → e, e+1 → (P)	[2]

LOGICAL/CONTROL

MNEMONIC	DESCRIPTION	TIMING
AND	a1 } (e) and (A) → (A)	[3]
ANDS	a2 } (e) and (A) → (A)	[2]
XOR	a1 } (e) eor (A) → (A)	[3]
XORS	a2 } (e) eor (A) → (A)	[2]
ORA	a1 } (e) or (A) → (A)	[3]
ORAS	a2 } (e) or (A) → (A)	[2]
HLT	Halt	[-]
NOP	No operation	[1.4]
OVF	n → OV	[1]
SPF	1 → Protect Flag	[1]

DATA WORD FORMATS



REGISTER SHIFTING

MNEMONIC	DESCRIPTION	TIMING
ASLA	n Arithmetic left shift	[1+.2n]
ASLB	n	← 0
ASRA	n Arithmetic right shift	[1+.2n]
ASRB	n	← 0
LSLA	n Logical left shift	[1+.2n]
LSLB	n	← 0
LSRA	n Logical right shift	[1+.2n]
LSRB	n 0 →	← 0
LRLA	n Logical shift rotate	[1+.2n]
LRLB	n	← 0
ASLD	n	← 0 [1+.4n]
ASRD	n	[1+.4n]
LSLD	n	← 0 [1+.4n]
LSRD	n 0 →	[1+.4n]
LRLD	n	[1+.4n]

REGISTER TRANSFER

MNEMONIC	DESCRIPTION	TIMING
CP	s, d [CPF] (s) → (d) [if OV = 1]	[1.4]
CPI	s, d [CPIF] (s) + 1 → (d) [if OV = 1]	[1.4]
CPD	s, d [CPDF] (s) - 1 → (d) [if OV = 1]	[1.4]
CPC	s, d [CPCF] (s) → (d) [if OV = 1]	[1.4]
CPN	s, d [CPNF] -(s) → (d) [if OV = 1]	[1.4]
CAB	s, d [CABF] (A) → (B), (s) → (d) [if OV = 1]	[1.4]
CAX	s, d [CAXF] (A) → (X), (s) → (d) [if OV = 1]	[1.4]
CXB	s, d [CXBF] (X) → (B), (s) → (d) [if OV = 1]	[1.4]
RGC	nnn Operation depends on bits nnn	[1.4]

s = Zero, A, B or X

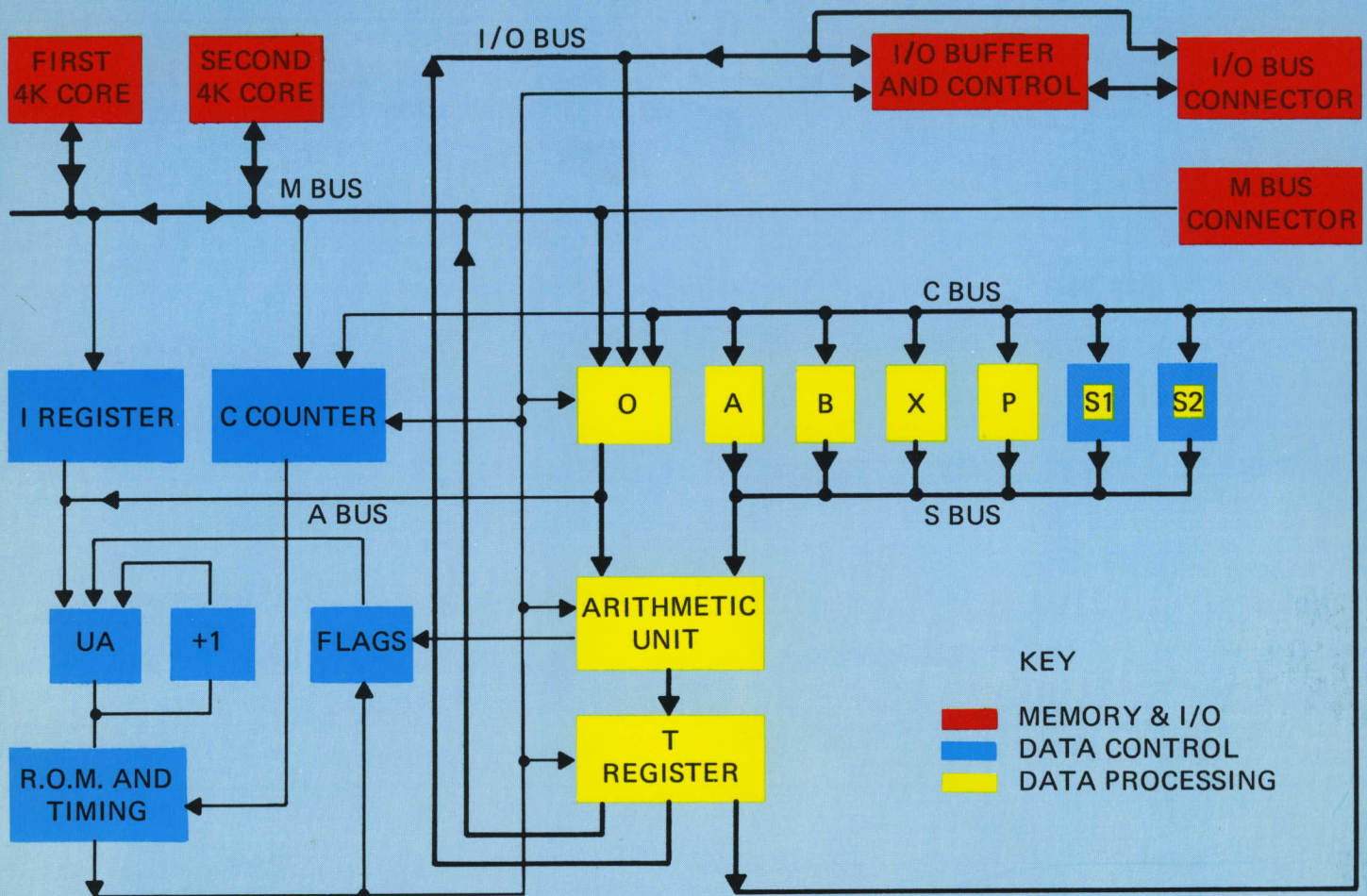
d = Zero, A, B, X, AB, AX, BX or ABX

OUTPUT

MNEMONIC	DESCRIPTION	TIMING
EXCA	n (A) → device n control	[1]
EXCB	n (B) → device n control	[1]
EXCX	n (X) → device n control	[1]
EXCM	n, a3 (e) → device n control	[3]
EXCI	n, v v → device n control	[2]
OTA	n (A) → device n data	[1]
OTB	n (B) → device n data	[1]
OTX	n (X) → device n data	[1]
OTM	n, a3 (e) → device n data	[2]
OTI	n, v v → device n data	[3]
ARM	arm interrupts, 0 → OV	[1]
DRM	disarm interrupts, 0 → OV	[1]
ARMF	arm interrupts, 1 → OV	[1]
DRMF	disarm interrupts, 1 → OV	[1]

INPUT

MNEMONIC	DESCRIPTION	TIMING
SENA	n device n status → (A)	[1]
SENB	n device n status → (B)	[1]
SENX	n device n status → (X)	[1]
SENM	n, a3 device n status → (e)	[3]
SENS	n, m skip if device n status (masked by m) = 0	[2]
CIA	n device n data → (A)	[1]
CIB	n device n data → (B)	[1]
CIX	n device n data → (X)	[1]
CIM	n, a3 device n data → (e)	[3]
INA	n device n data OR (A) → (A)	[1]
INB	n device n data OR (B) → (B)	[1]
INX	n device n data OR (X) → (X)	[1]



SPIRAS-65 BLOCK DIAGRAM

excellence in software

We can provide complete systems to the customer because of the extensive software package offered with each SPIRAS-65 unit. In addition to the programs described below, our staff of engineers and programmers can provide applications programs to fit customer requirements.

SYMBOLIC MACRO ASSEMBLER PROGRAM

Free format input.

Macro capability with noise words allowed in the argument list (8K required).

Listing includes octal value generated, relative assignment address, sequential line number, detailed error diagnostics, and a symbol table cross-reference listing (concordance).

Listing control pseudo-ops provided.

Absolute or relocatable object output fully compatible with FORTRAN object output.

System provides capability for sharing literals between sub-programs, and allows page-free addressing (system creates indirect address links automat-

ically if needed).

Operates in as little as 4K of memory (no macros).

FULL ASA FORTRAN-IV COMPILER

Operates in one pass in as little as 8K of memory. High level of expression, subscript and register optimization.

I/O device independent.

Comprehensive error diagnostic logic.

Symbolic output listing provided with side-by-side octal output data.

Relocatable object output, fully compatible with assembly output.

(continued)

EXCELLENCE IN SOFTWARE

LINKING LOADER PROGRAM

Loads absolute or relocatable programs.
Device independent operation.
Provides memory map.
Manages literal and indirect pointer pool.
Generates indirect addresses, if required.
Searches library tapes, if necessary.

DEBUG PROGRAM

Type memory in octal.
Memory modifications in octal.
Display and modify live registers.
Masked memory search within limits.
Enter break point and start compute.
Makes self loading tapes.

SOURCE PROGRAM EDITOR

Permits modification of source tapes (or disks).
Insertions and deletions by line number.

OBJECT PROGRAM EDITOR

Subroutines can be inserted, deleted or replaced in library tapes (or from disk).

INPUT/OUTPUT LIBRARY

ASCII to/from Binary Conversion
Fixed point single precision.
Fixed point double precision.
Floating point single precision.
Floating point double precision.
Integer.

Device Drivers for All I/O Devices
Open device.
Read/write data record.
Close-out device.
Provide special I/O function.

MATH LIBRARY

Single precision fixed point functions.
Double precision fixed point functions.
Single precision floating point functions.
Double precision floating point functions.
Complex functions.
Complete FORTRAN IV function library.

DIAGNOSTICS

CPU diagnostic.
Memory diagnostic.
Peripheral test programs.

OPERATING SYSTEM

Allows operator assignment of I/O devices.
Controls loading and operating of programs in batch mode.
Operates with basic computer system, a mag-tape system, or with a disk system.

CONVERSATION LANGUAGE*

Includes BASIC as a subset.
Allows macros to be defined and called.
Free-format including noise words and macros allows custom, user-oriented "languages" to be easily generated and used.

360-ASSEMBLER*

Allows assembly of SPIRAS-65 programs on the IBM-360 computer (Model 30 and above).
Available also on most other large computers.
Object output compatible with SPIRAS-65 assembly program object output.

360-SIMULATOR*

Allows simulation of SPIRAS-65 programs on the IBM computer (Model 30 and above).
Detailed trace listings and memory dumps available.
Available also on most other large computers.

*May be purchased. Not included with standard software package.



SPIRAS-65 has a twin called the IRASCOPE which is a DATA BASE EDITING DISPLAY.

Consider it as a peripheral to your SPIRAS-65.


Spiras Systems, Inc.
affiliate of
USM Corporation

332 Second Avenue
Waltham, Massachusetts 02154
617-891-7300 TWX 710-324-6699

USM is a world-wide 400 million dollar designer and manufacturer of systems, aimed at improving the productivity of manufacturing and service industries.

Spiras Systems Inc.,
formerly I.R.A. Systems, Inc.

JAN. 1, 1970



**SPIRAS-65
CONFIGURATOR
PRICE LIST**



Spiras Systems, Inc.
Affiliate of
USM Corporation

SPIRAS-65 CONFIGURATOR/PRICE LIST

The purpose of this configurator/price list is to allow Spiras Systems, Inc. sales personnel or customers to accurately define his system configuration and cost. More complex systems which cannot be defined by this document should be referred to the factory for quotation. All final pricing must be confirmed by the factory. These prices do not include OEM or quantity discounts. All pricing is for single-lot quantities. Systems houses wishing to buy peripheral controllers only are urged to request for quotation. All pricing is F.O.B. Whitinsville, Massachusetts.

SPIRAS-65 MAIN FRAME CONFIGURATIONS

There are three basic main frame types, each of which may contain up to 8K, 16-bit words of memory in modulo 4K increments. In addition, the main frame has the optional capability of containing a real-time clock, power fail module, and controllers for teletype, perforated tape equipments, an analog expansion chassis interface, and IRASCOPE CRT display interface.

Each of the main frame types includes the following hardware as standard items:

- Central Processing Unit (CPU)
- Memory — 4096 (16-bit) Words
- Input/Output/DMC Bus — 10 Devices
- Direct Memory Access Bus (DMA)
- Power Supply — With Cooling
- Front Control Panel
- Enclosure
- Read-Only Memory — Microprocessor (ROM), Contains:
 - Bootstrap Loader
 - Add/Subtract
 - Multiply
 - Divide
 - Normalize
 - Double Precision Add/Subtract
 - Floating Point Add, Subtract, Multiply, Divide
 - Priority Interrupt
 - Block Transfer Cycle Stealing I/O
 - Extensive Conditional Instructions

Each of the main frame types includes the following standard software packages:

- Symbolic Macro Assembler Program (8K Only)
- Basic Assembler Program (4K)
- ASA Fortran IV Compiler (8K Only)
- Linking Loader
- Debug Program
- Source Program Editor
- Object Program Editor
- Input/Output Library
- Math Library
- Diagnostics
- Operating System

Operator training for one man-week is provided in the basic price. A two-week maintenance course for one person is also provided in the basic price. All peripheral prices include driver software. The main frame prices include a one-year warranty.

MAIN FRAME CONFIGURATOR

The configuration for the main frame complement is specified by an eight-part, two-digit number as follows:

SP-65-A-B-C-D-E-F-G-H

where,

	Price		Price
A = Main Frame Type Designator		F = Perforated Tape Equipment Designator (Includes Paper Tape Equipment)	
A = 00, 4K Memory Rack Mount Version with Slides	\$14,400	F = 50, No Paper Tape Equipment	—
A = 01, 4K Memory Desk Top Console Version	\$14,900	F = 51, Reader with Reeling (300 characters/second)	\$ 3,500
A = 02, 4K Memory Rack Mount Version with Remote Console	\$15,400	F = 52, Reader without Reeling (300 characters/second)	\$ 2,500
B = Main Frame Memory Size Designator		F = 53, Punched Paper Perforator (120 characters/second)	\$ 3,950
B = 10, Memory is 4K, 16-bit Words	—	F = 54, Combination of 51 and 53	\$ 6,950
B = 11, Memory is 8K, 16-bit Words, Add	\$ 4,800	F = 55, Combination of 52 and 53	\$ 5,950
C = Real-Time Clock Designator		F = 56, Mylar Punch (60 characters/second)	\$ 4,900
(Provides for basic crystal-controlled standard with intervals as low as 5 microseconds and 1/1000th second, 1/100th second, 1/10th second, and 1 second timing markers for computer interrupt and clock logging purposes. Event or elapsed time can be updated by the SPIRAS-65. Special crystal can be provided for other time intervals.)		G = CRT IRASCOPE Data Base Editing/Communications Console Designator	
C = 20, No Real-Time Clock Installed	—	(See Spiras Systems' IRASCOPE brochure for description.)	
C = 21, Real-Time Clock Installed (2 mHz crystal), Add	\$ 900	G = 60, No IRASCOPE	—
C = 22, Real-Time Clock Installed (special crystal), Add	\$ 1,025	G = 61, Serial TTY Channel Interface	\$ 5,995
D = Power Fail Safe Designator		G = 62, Serial High-Speed Interface	\$ 6,525
(This option detects power failure in the computer and allows controlled computer shutdown so that data in memory will not be destroyed.)		G = 63, Parallel "Hand Shake" Interface	\$ 6,700
D = 30, No Power Fail Safe Installed	—	H = Analog Expansion Chassis Interface Designator	
D = 31, Power Fail Safe Installed, Add	\$ 750	(This module allows the interface to the analog modules contained in the Model 500 analog expansion.)	
E = Teletype Designator (Includes Teletype Unit)		H = 70, No Analog Expansion Chassis Interface	—
E = 40, No Teletype Interface Installed	—	H = 71, Analog Expansion Interface Installed	\$ 650
E = 41, ASR-33 Interface Installed	\$ 1,950		
E = 42, ASR-35 Interface Installed	\$ 3,950	EXAMPLE: A rack mount main frame with 8K memory, an ASR-33, a reader with reeling, and a parallel-interfaced IRASCOPE would be denoted as follows:	
E = 43, KSR-35 Interface Installed	\$ 3,100	SP-65-00-11-20-30-41-51-63-70	

MEMORY EXPANSION CHASSIS WITH POWER SUPPLY

If the system requires more memory than 8K words, a memory expansion chassis would be required. Each memory expansion chassis has an 8K memory capacity and occupies 8.75 inches of rack space.

		Price
SP-65-101	Expansion Chassis with 4K Memory	\$ 6,800
SP-65-102	Expansion Chassis with 8K Memory	\$11,600

PERIPHERAL CONTROLLER EXPANSION CHASSIS WITH POWER SUPPLY

The peripheral controller expansion chassis with power supply has a 30-card capacity. The number of card slots required for a given controller is indicated in parenthesis. In ordering peripherals, simply add the number of cards per controller to obtain the number of expansion chassis required for the entire system. This unit occupies 5.25 inches of rack space.

		Card Slots	Price
SP-65-150	Peripheral Expansion Chassis		\$ 910
SP-65-151	I/O Bus Repeater — 10 Devices (An I/O bus repeater is required for every 10 device controllers, including those contained in the main frame.)	(3)	\$ 1,000

Magnetic Tape Units (In Cabinet)

All units contain controllers and read/write electronic. All units are 9-track, 556 or 800 BPI, and are IBM compatible. Seven-track or 200 BPI units are available on special factory quote.

		Card Slots	Price
SP-65-200	24 ips	(10)	\$12,900
SP-65-201	45 ips	(10)	\$22,000
SP-65-202	75 ips	(10)	\$24,500
SP-65-203	DMA Device Controller for 200, 201, 202, Add	(5)	\$ 2,500

Magnetic Tape Cassettes

Magnetic tape cassettes provide 180,000, 8-bit characters, 800 characters per second read/write, 75 millisecond start/stop time. Prices include controllers. All units are rack mountable.

		Card Slots	Price
SP-65-205	Single Cassette	(6)	\$ 1,995
SP-65-206	Dual Cassette	(6)	\$ 2,950
SP-65-207	Triple Cassette	(6)	\$ 3,900

Line Printer

		Card Slots	Price
SP-65-210	132-column, 450 alpha-numeric lines per minute (self contained controller)		\$22,500
SP-65-211	132-column (25 characters/second), 11 alpha-numeric lines/minute for 132-column	(5)	\$ 5,995

Card Systems (In Cabinet)

SP-65-220	Reader (300 Cards/Minute)	(10)	\$ 3,950
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Disc Packs (In Cabinet)

The Removable Disc Pack is IBM compatible, having 640,000 16-bit words per disc. The average head access time is 60 milliseconds, and the average latency time is 20 milliseconds. The combination disc pack and disc has 640,000 words of pack removable storage and 640,000 words of permanent disc storage with identical access times.

		Card Slots	Price
SP-65-230	640K Words	(6)	\$20,900
SP-65-231	1.28 million words, 640K of which is on fixed disc	(6)	\$23,500
SP-65-232	Dual, with 1.28 million words	(6)	\$32,133
SP-65-233	Dual, with 2.56 million words, 1.28 million of which is on fixed disc	(6)	\$37,450
SP-65-234	DMA Device Controller for 230, 231, 232, 233, Add	(6)	\$ 2,500

Disc Files

The fixed head disc files have 8 records per track, each record having 256 words. The access time is 16.7 milliseconds, and the data rate is 75 KC.

		Card Slots	Price
SP-65-240	8K Words	(5)	\$ 6,295
SP-65-241	16K Words	(5)	\$ 7,182
SP-65-242	32K Words	(5)	\$ 8,500
SP-65-243	48K Words	(5)	\$ 9,810
SP-65-244	64K Words	(5)	\$11,169
SP-65-245	DMA Device Controller for 240 through 244, Add	(5)	\$ 2,500

Digital Plotters

SP-65-250	300 Steps/Second	(4)	\$ 8,500
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Modem Interfaces

(Does Not Include Modem)

For 202C, 202D or Lower Speed Modems or Acoustic Coupler

SP-65-300	Half Duplex Asynchronous, Up to 1800 Baud	(4)	\$ 1,250
SP-65-301	Full Duplex Asynchronous, Up to 1800 Baud	(5)	\$ 1,500

General-Purpose Modules Interfaced

SP-65-400	8-Bit Register with Latch	(1)	\$ 224
SP-65-401	8-Bit Register without Latch	(1)	\$ 169
SP-65-402	I/O Control with Interrupt & Trap	(1)	\$ 230
SP-65-403	16-Bit Sense Status Module	(3)	\$ 600
SP-65-405	Universal Inter coupler Interface (Spiras Model 709A accepts 4 to 44 BCD characters)	(3)	\$ 1,000
SP-65-406	Time-of-Day Clock Interface (Spiras Model 7004)	(4)	\$ 600
SP-65-407	Parallel I/O Channel, 16-Bit Interface	(4)	\$ 895
SP-65-408	General-Purpose Programmable Instrument Module, Interfaces to Digital Instrumentation		Factory Quote

ANALOG EXPANSION CHASSIS WITH POWER SUPPLY

The analog expansion chassis has 16-card capacity. The number of card slots required for a given analog device are indicated in parenthesis. In ordering analog devices, add the number of cards per device to determine how many analog expansion chassis are needed for the system. This unit occupies 7. inches of rack space.

SP-65-500	Analog Expansion Chassis with Power Supply		\$ 1,300
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Analog-to-Digital Converters

SP-65-501	12-Bit, including sign, 0-10 volt, 12 μ sec word conversion	(2)	\$ 1,500
SP-65-502	Dual Model 300	(2)	\$ 2,400
SP-65-503	.1% Digital Voltmeter with Display (Spiras Model 600)	(2)	\$ 1,000

Digital-to-Analog Converters

SP-65-510	9-Bit with Sign	(3)	\$ 1,550
SP-65-511	12-Bit with Sign	(3)	\$ 1,600
SP-65-513	15-Bit with Sign	(3)	\$ 1,650
SP-65-514	Dual 9-Bit with Sign	(3)	\$ 1,950
SP-65-515	Dual 12-Bit with Sign	(3)	\$ 2,050
SP-65-516	Dual 15-Bit with Sign	(3)	\$ 2,150

Amplifiers

SP-65-520	Differential	(1)	\$ 400
SP-65-521	Sample and Hold	(1)	\$ 450

Multiplexers

SP-65-525	High level 16-channel one-wire, or 8-channel two-wire	(2)	\$ 1,300
SP-65-526	Additional 16-channel one-wire, or 8-channel two-wire module — up to 7		\$ 500 ea.
SP-65-527	Special Multiplexer Configurations		Factory Quote

	<u>Accessories</u>	Price
SP-65-600	System Cabinet with AC Service (70" x 25" x 30")	\$ 750.00
SP-65-601	Dual System Cabinet with AC Service (70" x 50" x 30")	\$1,300.00
SP-65-602	Maintenance Test Set with Readout on all Registers	\$2,500.00
SP-65-603	Motor Generator/Line Isolator, .5 KVA	\$1,475.00
SP-65-604	Motor Generator/Line Isolator, 1 KVA	\$1,798.00
SP-65-606	Spare Card Parts Kit	\$3,995.00
SP-65-607	Special Paint (two-tone)	\$ 195.00
SP-65-608	Desk Enclosure Unit	\$ 300.00
SP-65-609	Instruction Manuals (Additional)	\$ 3.00
	<u>Software</u>	
SP-65-700	IBM 360 Assembler	\$2,500.00
SP-65-701	IBM 360 Assembler & Simulator	\$3,500.00
SP-65-702	Autoscan/Log	Factory Quote
SP-65-703	Control Output	Factory Quote
SP-65-704	Gas Chromatograph Control	Factory Quote
SP-65-705	Nonlinear Optimizer	Factory Quote
SP-65-706	Data Acquisition	Factory Quote
SP-65-707	Custom Application Packages	Factory Quote
	<u>Other Support Services</u>	
SP-65-800	Installation (two man-days and expenses)	\$ 500.00
SP-65-801	Additional Operator Training (For Programmers) – Per Man	\$ 300.00
SP-65-802	Additional Two-Week Maintenance Training (For Technicians)	\$ 600.00
SP-65-803	Systems Analysis Consulting	Factory Quote
SP-65-804	Maintenance Contracts	Factory Quote
SP-65-805	Special Computer-Centered Systems	Factory Quote

NOTES:

1. All prices are subject to change without notice.
2. This price list supercedes all prior price lists.
3. Leasing is available upon request.



Spiras Systems, Inc.
Affiliate of
USM Corporation

332 Second Avenue
Waltham, Massachusetts 02154
617-891-7300 TWX 710-324-6699

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